

## PATENT COOPERATION TREATY

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INTERNATIONAL PRELIMINARY EXAMINATION REPORT  
(PCT Article 36 and Rule 70)

Applicant's or agent's file reference WO382-7437003	<b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/EP 03/13942	International filing date (day/month/year) 09.12.2003	Priority date (day/month/year) 21.12.2002
International Patent Classification (IPC) or both national classification and IPC C07C29/151		
Applicant HALDOR TOPSOE A/S et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 5 sheets, including this cover sheet.

This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of sheets.

3. This report contains indications relating to the following items:

- I  Basis of the opinion
- II  Priority
- III  Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV  Lack of unity of invention
- V  Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI  Certain documents cited
- VII  Certain defects in the international application
- VIII  Certain observations on the international application

Date of submission of the demand 04.11.2004	Date of completion of this report 24.03.05
Name and mailing address of the international preliminary examining authority:   European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized Officer  Breimaier, W Telephone No. +49 89 2399-8327



**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**

International application No. PCT/EP 03/13942

**I. Basis of the report**

1. With regard to the elements of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

**Description, Pages**

1-14 as originally filed

**Claims, Numbers**

1-4 received on 14.11.2004 with letter of 02.11.2004

**Drawings, Sheets**

1/3-3/3 as originally filed

2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- the language of publication of the international application (under Rule 48.3(b)).
- the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- contained in the international application in written form.
- filed together with the international application in computer readable form.
- furnished subsequently to this Authority in written form.
- furnished subsequently to this Authority in computer readable form.
- The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- the description, pages:
- the claims, Nos.:
- the drawings, sheets:

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5.  This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).  
*(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)*

6. Additional observations, if necessary:

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Statement

Novelty (N)	Yes: Claims	1-4
	No: Claims	
Inventive step (IS)	Yes: Claims	
	No: Claims	1-4
Industrial applicability (IA)	Yes: Claims	1-4
	No: Claims	

2. Citations and explanations

**see separate sheet**

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EXAMINATION REPORT - SEPARATE SHEET**

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**Re Item V**

**Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

D1: EP-A 0 790 226

**novelty Art. 33(2) PCT**

The present invention concerns a catalytic two-stage process for making methanol from synthesis gas according to claim 1, steps (a-e) which differs from the available state of the art by the fact that the process stream of the first stage is cooled which is then reduced in a second stage according to steps b) and c).

The subject-matter according to claim 1 and dependent claims 2-4 are therefore new.

**inventive step Art. 33(3) PCT**

The present subject-matter according to claims 1 to 4 seems not to be based on an inventive step.

The closest state of the art D1 concerns an at least two-stage methanol process from synthesis gas on a Cu based catalyst wherein the effluent stream of the first reactor is directly without cooling introduced into a second reactor being cooled (see page 2, I. 32-38, 55/56, page 3, I. 14/15, I. 30-32, claims 1 and 3, fig. 1 and example).

In view of D1, the problem to be solved by the present invention is the provision of an alternative methanol process.

The present solution to this problem resides in the finding that the effluent stream of the first reactor is first cooled which is then introduced into a second reactor for hydrogenating as described in claim 1, fig. 2 and the examples.

In view of the teaching of D1 combined with common general knowledge, it is considered that the skilled person would have reached at the present solution in an obvious manner. D1 already teaches that reduced hydrogenation temperatures favour the production of methanol. This is realised by hydrogenating a first process stream in a second stage whilst being cooled therein (see page 3, I. 30-32). In contrast to D1, in the present MeOH process the first process stream is cooled and then hydrogenated in a second stage. This different "cooling" embodiment, i.e. hydrogenating and cooling within the second reactor (D1) or hydrogenating a pre-cooled process stream in a second reactor (invention), in order to favour the production of methanol appears to be an obvious means requiring no inventive skill of the skilled person using his common general knowledge in order to exploit the teaching of D1.

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In addition, it is noted that in the process of D1 as well as in the present method the production of MeOH is favoured, i.e. in D1 aldehydes and ketones which are common by-products although not explicitly described therein are also "implicitly" reduced. Thus, the mere fact that in D1 these by-products are not explicitly described as being reduced during hydrogenation cannot be used to establish inventiveness of the present process.

Furthermore, no advantageous and/or surprising effect vis-à-vis D1 has been shown which would support inventiveness for an improved methanol process. Thus, an inventive step for the subject-matter as claimed cannot be given.

**further remarks**

Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in the documents D1 as well as EP-A 0 501 331, EP-A 0 483 919, EP-A 0 682 002, US-A 4 766 154 and US-A 5 753 194 is not mentioned in the description, nor are these documents identified therein.

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International Patent Application No. PCT/EP03/13942  
Haldor Topsøe A/S  
Date: 02 November 2004

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**CLAIMS**

1. A process for the production of methanol from a  
10 feed stream being rich in hydrogen, carbon monoxide and  
carbon dioxide comprising the steps of

(a) contacting the feed stream with a methanol synthesis catalyst and obtaining a process stream comprising  
15 methanol, aldehydes and ketones and unconverted hydrogen, carbon monoxide and carbon dioxide;

(b) cooling the process stream of step (a) to a temperature of between 20°C and 200°C;  
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(c) contacting the cooled process stream from step (b) with a hydrogenation catalyst being active in the hydrogenation of aldehydes and ketones into corresponding alcohols and obtaining a process stream being enriched in  
25 methanol and depleted in aldehydes and ketones;

(d) cooling and condensing the process stream of step (c);  
and

30 (e) separating the process stream of step (d) into a gas phase and a liquid phase with crude methanol.

2. The process of claim 1, wherein the hydrogenation catalyst contains 10-95% by weight of copper.

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3. The process of claim 1, wherein the hydrogenation catalyst is a noble metal based catalyst.

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4. The process of claim 1, wherein the hydrogenation catalyst is in the form of pellets, extrudates, monolith, catalysed hardware or a powder suspended in a liquid methanol phase.

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